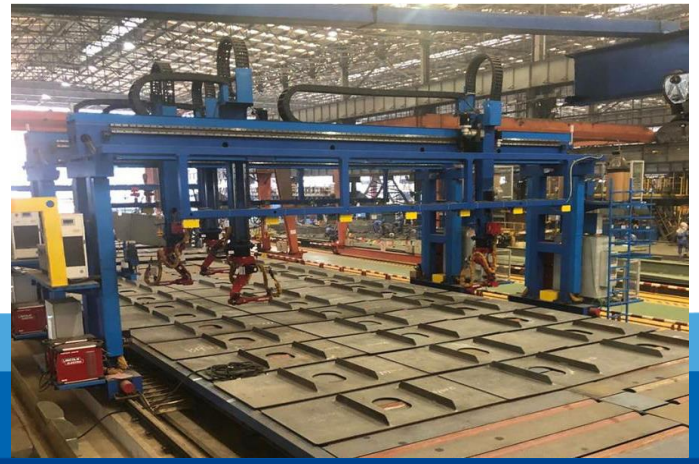
Active Shipbuilding Experts' Federation

ASEF

The Road to Green and Low/Zero Carbon Transformation of Asian Shipbuilding Industry under Global Environmental Governance



Active Shipbuilding Experts' Federation(ASEF)

November 2023

Dr. Zhang Yunsong

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I. Main Carbon Emission Sources in Shipbuilding Process

I-1 Definition of Carbon Emission

Narrow Sense	**Greenhouse gases and other carbon emissions that cause the greenhouse effect, including CO_2, CO, CH_4, etc;**
Broad Sense	**NOx, SOx; Also including PM, black carbon and VOCs that included in the *Final Report of Fourth IMO GHG Study***
Definition for Shipbuilding Industry	**Currently known: CO_2、CO、CH_4、VOCs、PM.** **Need for further discussion: Development of the definition and scope of carbon emission sources applicable to the shipbuilding industry**

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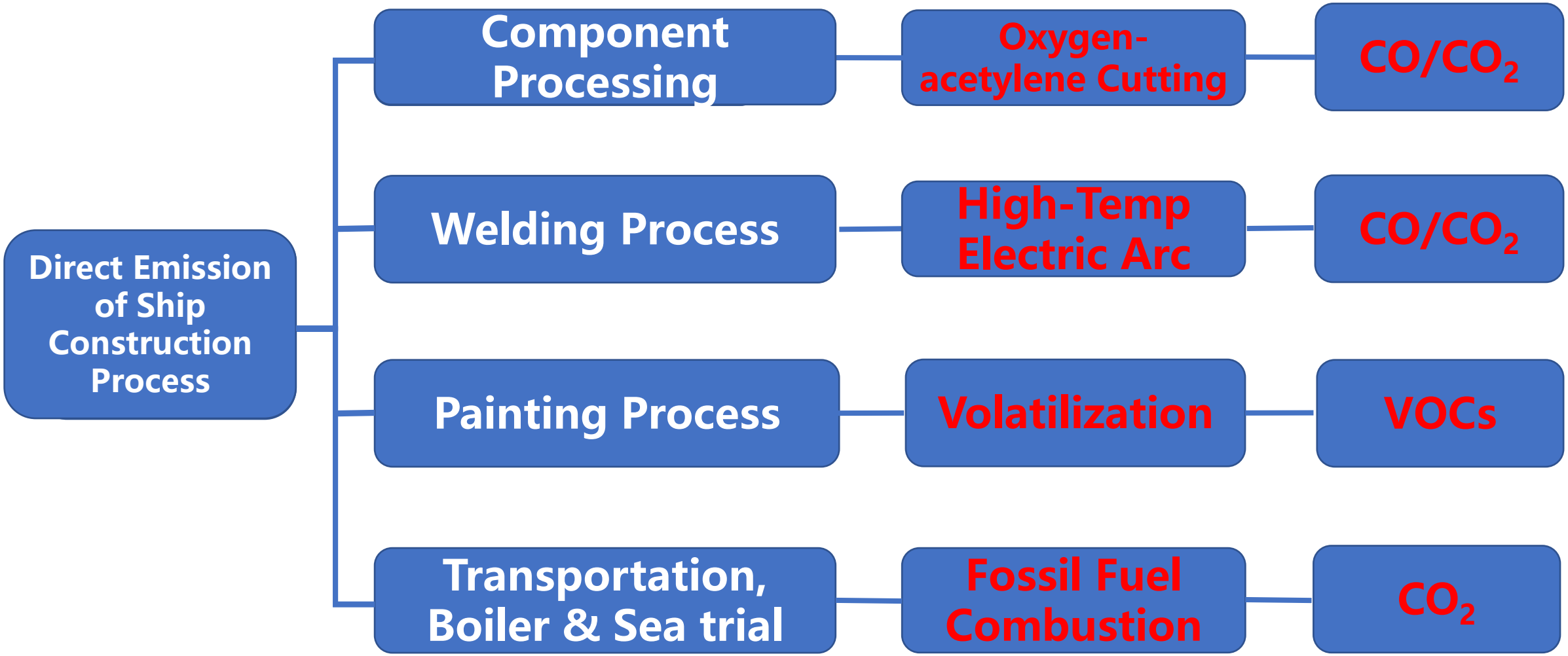
I. Main Carbon Emission Sources in Shipbuilding Process

I-2 Direct Emission of Ship Construction Process



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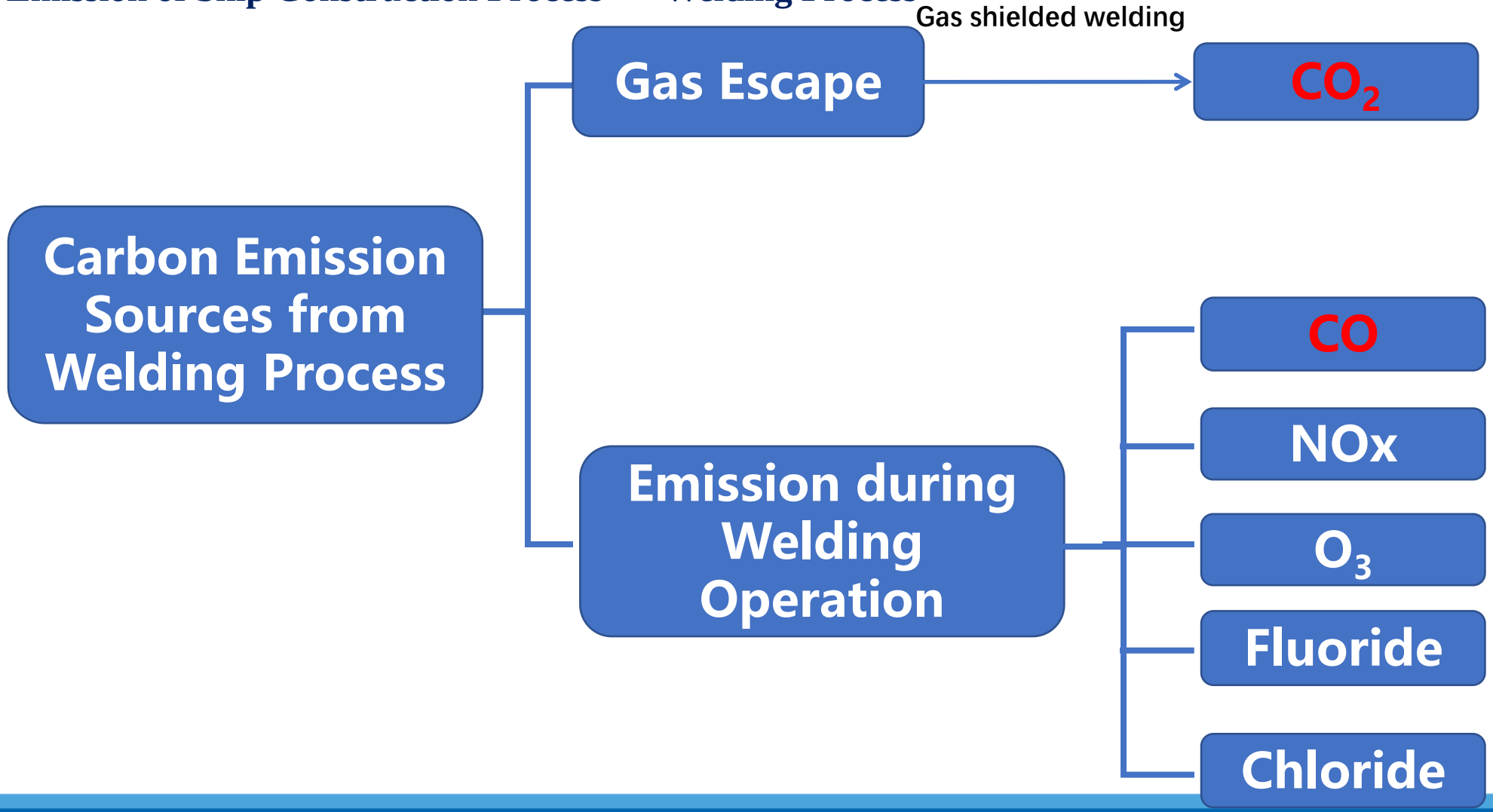
I. Main Carbon Emission Sources in Shipbuilding Process

I-2 Direct Emission of Ship Construction Process-----Welding Process



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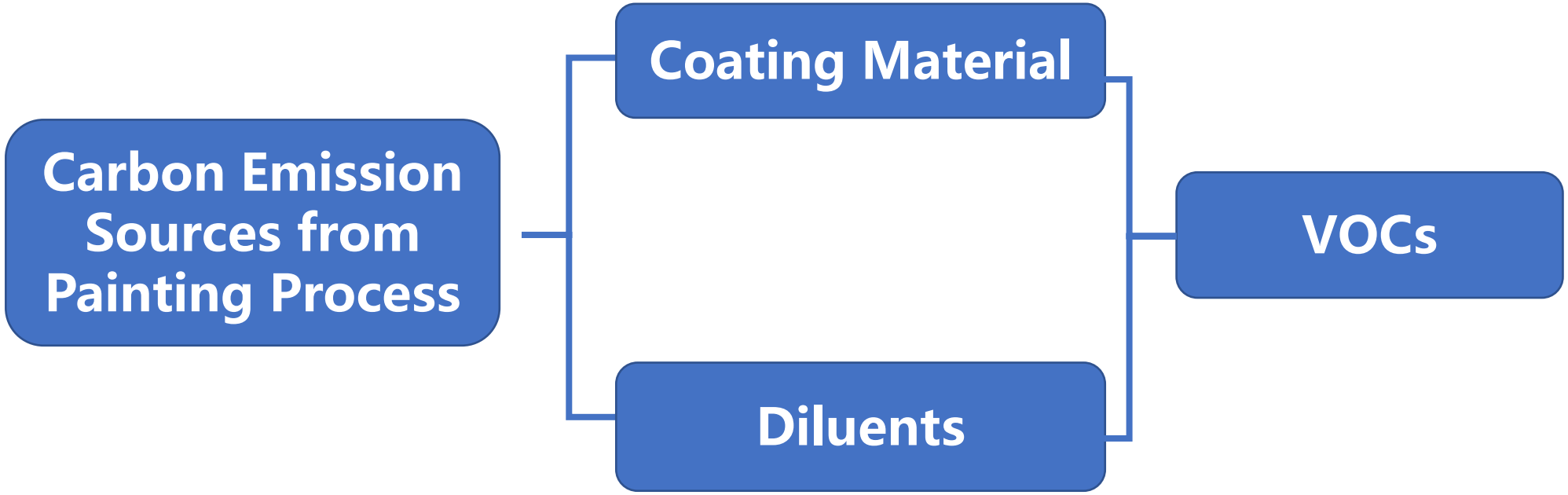
I. Main Carbon Emission Sources in Shipbuilding Process

I-2 Direct Emission of Ship Construction Process-----Painting Process



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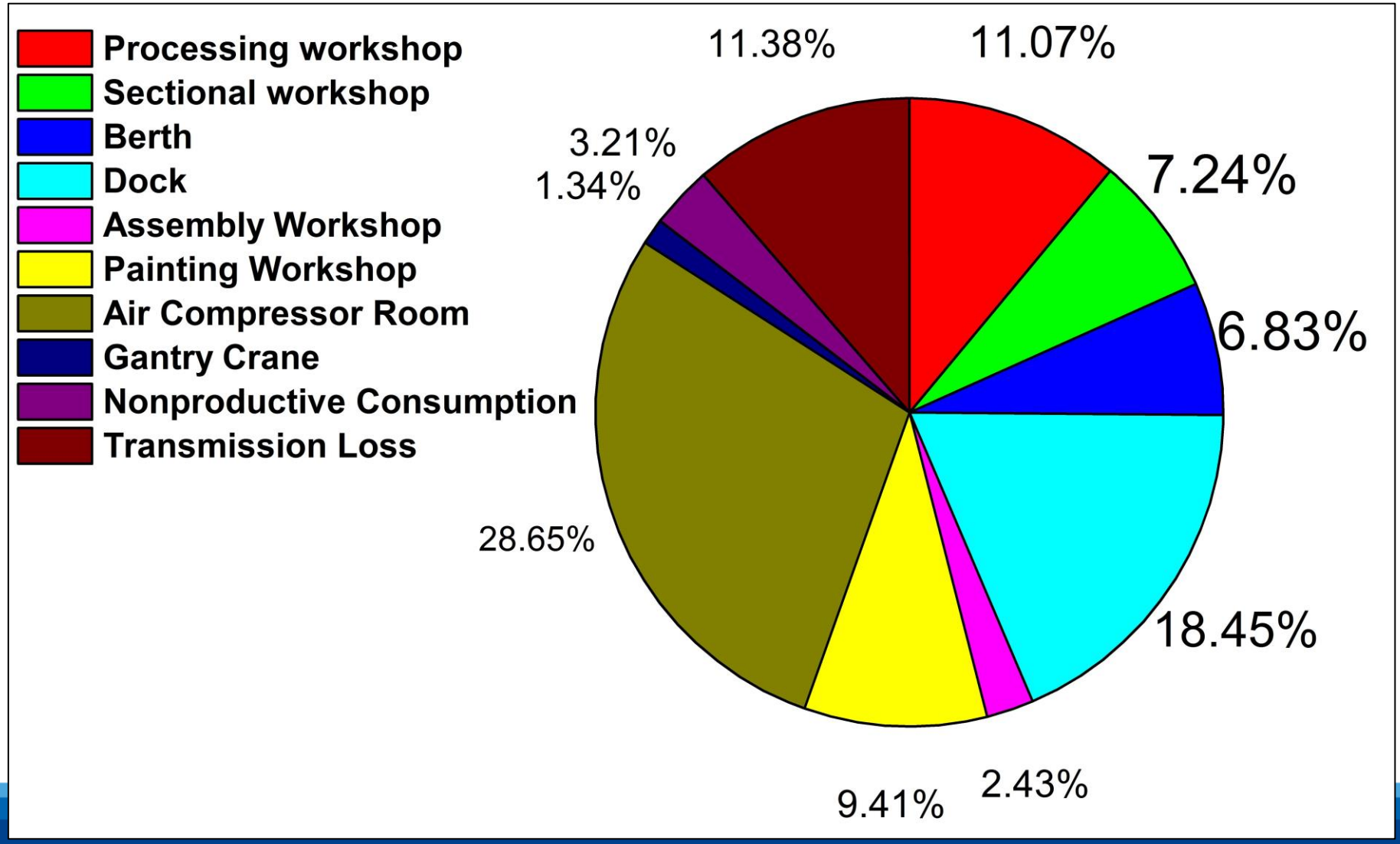
I. Main Carbon Emission Sources in Shipbuilding Process

I-3 Indirect Emission of Ship Construction Process-----Electrical Power Consumption



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II. Application Technology & Equipment of Emission Reduction in Shipbuilding Process

II-1 Technology and Application of Solar Energy, Wind Energy, Tidal Energy

Photovoltaic Power Generation System	**Supplement large power consumption of shipyards**
Wind Power Generation System	**Use of sufficient and continuous wind energy along the river banks and coasts**
Tidal Power Generation System	**Utilizition of the potential energy generated by the water level difference of tidal fluctuation**

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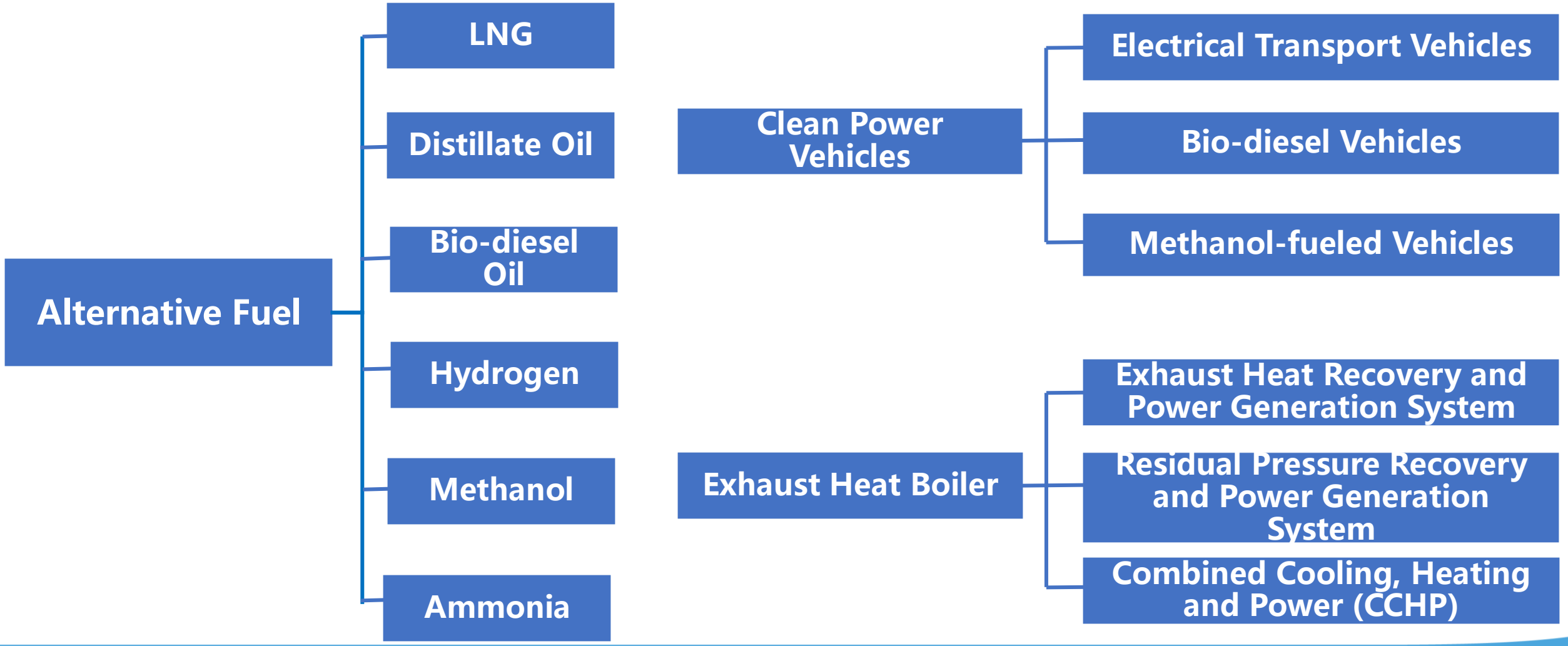
II. Application Technology & Equipment of Emission Reduction in Shipbuilding Process

II-2 Alternative Fuel and Exhaust Heat Recovery Technology



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II. Application Technology & Equipment of Emission Reduction in Shipbuilding Process

II-3 High Efficient Welding Technology & Equipment

Welding Green Materials	**Low toxicity;** **Less smoke;** **Less environmental pollution;** **High welding efficiency**
Welding Process Optimization	**Laser welding;** **Laser arc hybrid welding;** **Friction stir welding;**
Harmful Gas Treatment	**At present: local ventilation and comprehensive ventilation;** **In the future: small, flexible and low-energy mobile treatment equipment**

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II. Application Technology & Equipment of Emission Reduction in Shipbuilding Process

II-3 High Efficient Welding Technology & Equipment

Intelligent Welding Test Verification Platform

Laser Welding

Intelligent Welding Production Line

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II. Application Technology & Equipment of Emission Reduction in Shipbuilding Process

II-4 VOCs Emission Reduction Control Technology in Painting Process

VOCs Emission Reduction Control in Painting

Environmental Protection Coating

High solid composition epoxy coatings, solventless coatings, water-borne coatings, low surface energy antifouling coatings

Coating Surface Treatment Technology

Metallic surface treatment, laser derusting, low pressure fine atomization technology, luction dedusting cleaning

Green Production Technology of Painting Workshop

Blasting-sand robot , environmental monitoring system for painting workshop

Coating Emission Control Technology and Equipment

Spraying-paint robot for VOCs reduction, electrostatic spraying technology, environmental monitoring technology for outfield painting

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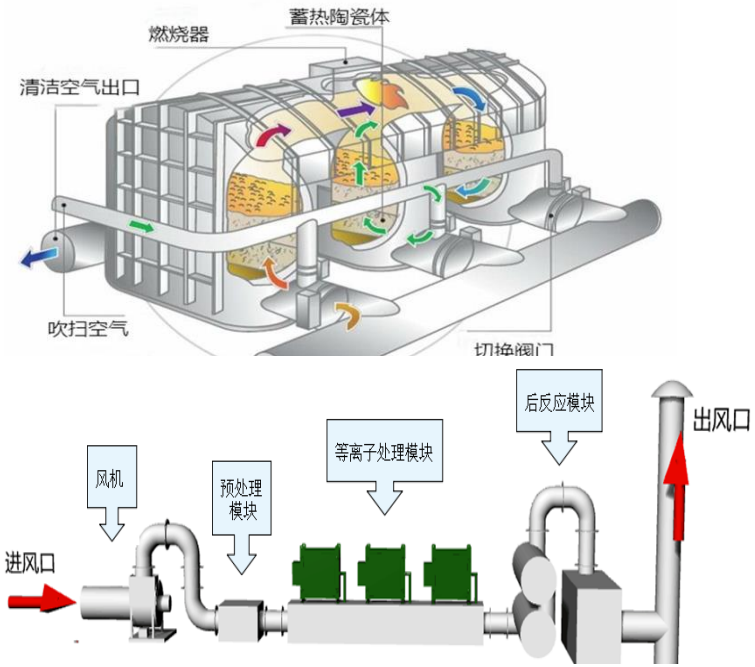
II. Application Technology & Equipment of Emission Reduction in Shipbuilding Process

II-4 VOCs Emission Reduction Control Technology in Painting Process

Green Material Painting Workshop

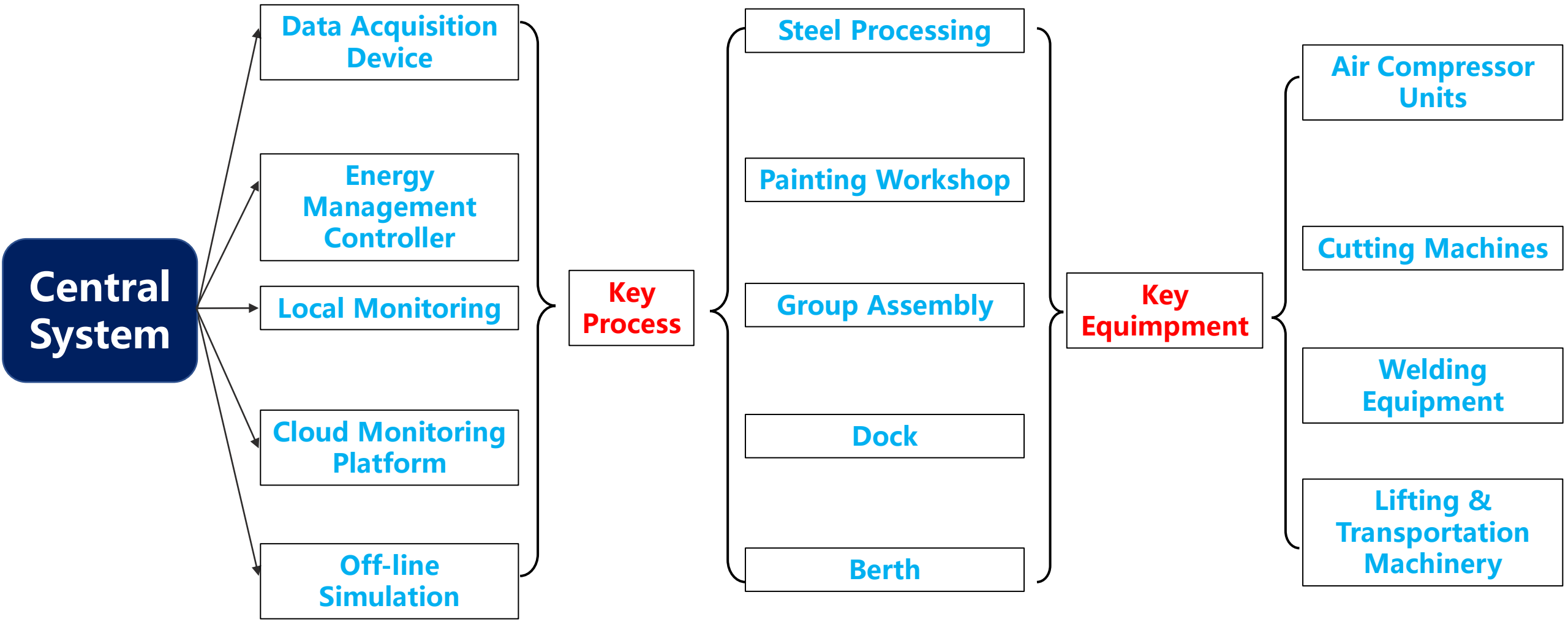
VOC Reduction & Control of Outfield Painting



Application of VOC Control System Technology

II. Application Technology & Equipment of Emission Reduction in Shipbuilding Process

II-5 Intelligent Energy Management and Control System



II. Application Technology & Equipment of Emission Reduction in Shipbuilding Process

II-5 Intelligent Energy Management and Control System

Intelligent Energy Management and Control System Panel

Intelligent Processing Line

Intelligent Cutting Machine

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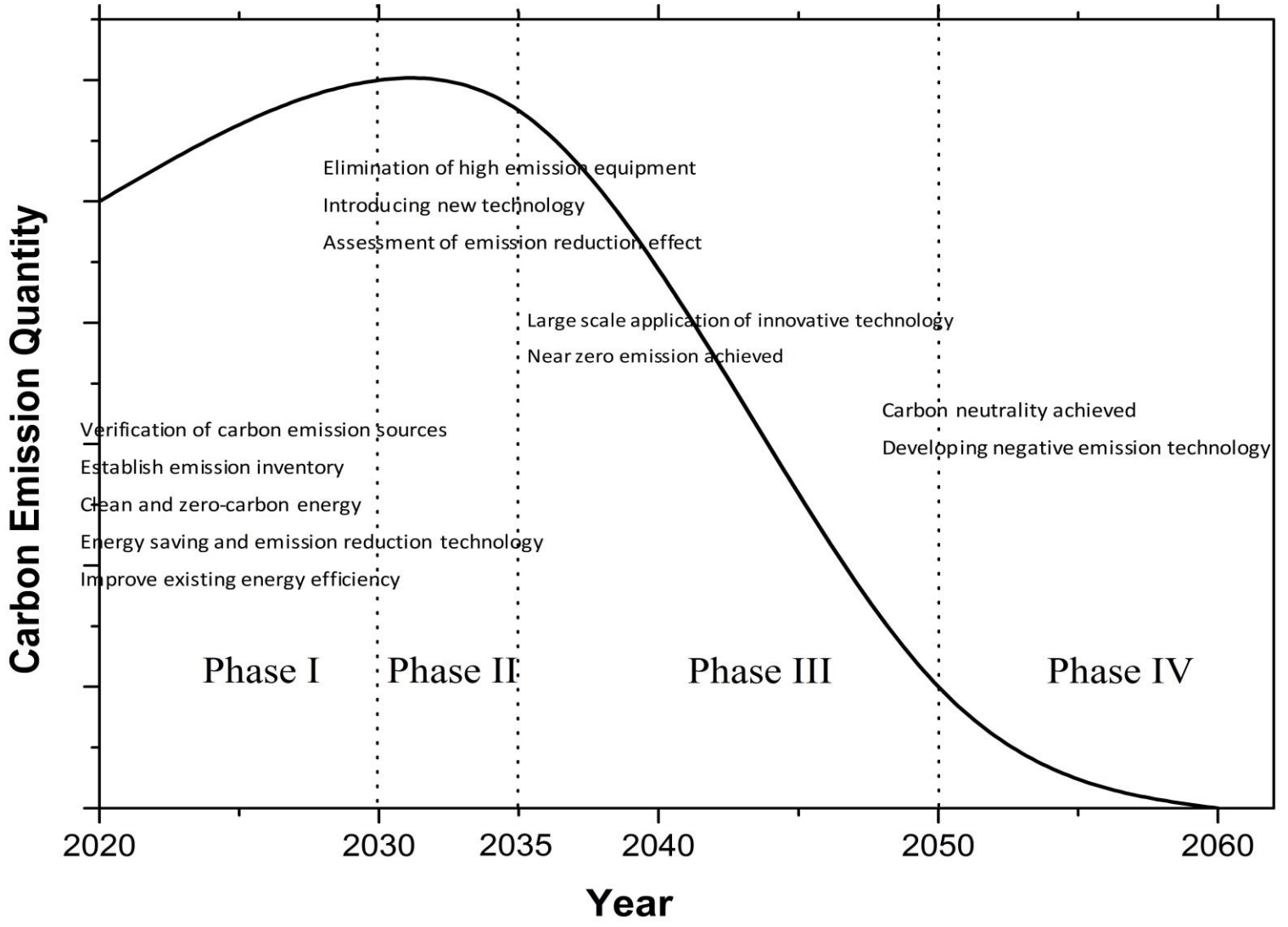
The Road to Green and Low/Zero Carbon Transformation of Asian Shipbuilding Industry under Global Environmental Governance

III. Preliminary Development Plan of Carbon Neutrality in Shipbuilding Industry

III-1 Development Timeline of Carbon Neutrality in Shipbuilding Industry



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III. Preliminary Development Plan of Carbon Neutrality in Shipbuilding Industry

III-2 Key Technology of Carbon Neutrality in Shipbuilding Industry

1. Carbon emission accounting and management technology of shipbuilding industry

Including development of carbon emission calculation technology, construction of carbon emission accounting system , and technology of intelligent energy consumption management system for the whole industrial chain of shipbuilding industry.

2. Fuel and energy saving & emission reduction device & technology

Including alternative fuel and zero carbon fuel (such as LNG in transition period, and future fuels such as hydrogen, ammonia, biomass), new energy (such as heat pump, solar energy, tidal energy), combustion equipment optimization technology (such as boiler combustion chamber optimization, electronic timing injection), and low grade heat source recovery and utilization technology of exhaust heat.

3. Carbon capture, utilization and storage (CCUS) technology

CCUS is the only theoretically feasible technology to achieve large-scale low-carbon utilization of fossil energy, including carbon dioxide capture, storage and conversion directly for various carbon emission sources of shipbuilding industry, and the low-cost commercial operation mode of this process.

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